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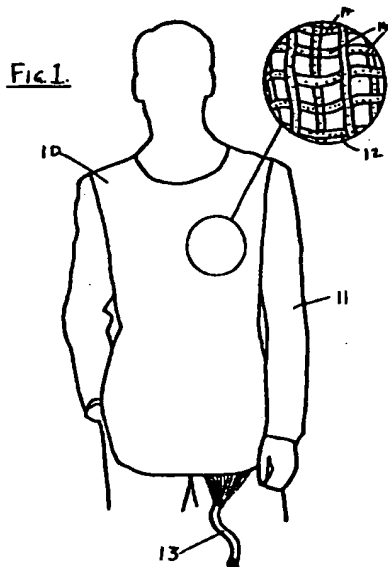
US 5187765 A US 5042892 A US 4977487 A
US 4727603 A US 4715700 A US 4234907 A

(58) Field of Search

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V9B6 V9C2A V9C2B, E1G GLJ GLR, F4R RAG,
G2J JGX
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(54) Visual warning device

(57) A device to provide visual warning of the presence of a person or other object in poorly illuminated or unilluminated locations comprises a fabric in the form of an elongated strip or of a garment 10, fig 1 (or 20, 21 fig 2) which fabric includes a multiplicity of strands 12, (23) of optical fibre, at least some of which are modified 14, (25) to divert light outwardly from the sides of the strands, and a source of light to supply light along the strands. The fabric may be woven, knitted, plaited, or formed of strands adhered to a backing, which may be reflective. The modification may be in the form of nicks, notches, grooves, indentations or other irregularities. The garment may be a belt, armband, waistband, overjacket, vest, fitted sash, hat or cap or may be for an animal e.g. a saddle or horse-blanket. Alternatively, the strip may be applied across or along a vehicle, or to traffic cones or other road signs. The light source may be a candescent light or an LED or laser, and may be continuous or flashing. It may be powered by a battery, which may be rechargeable.



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FIG. 1.

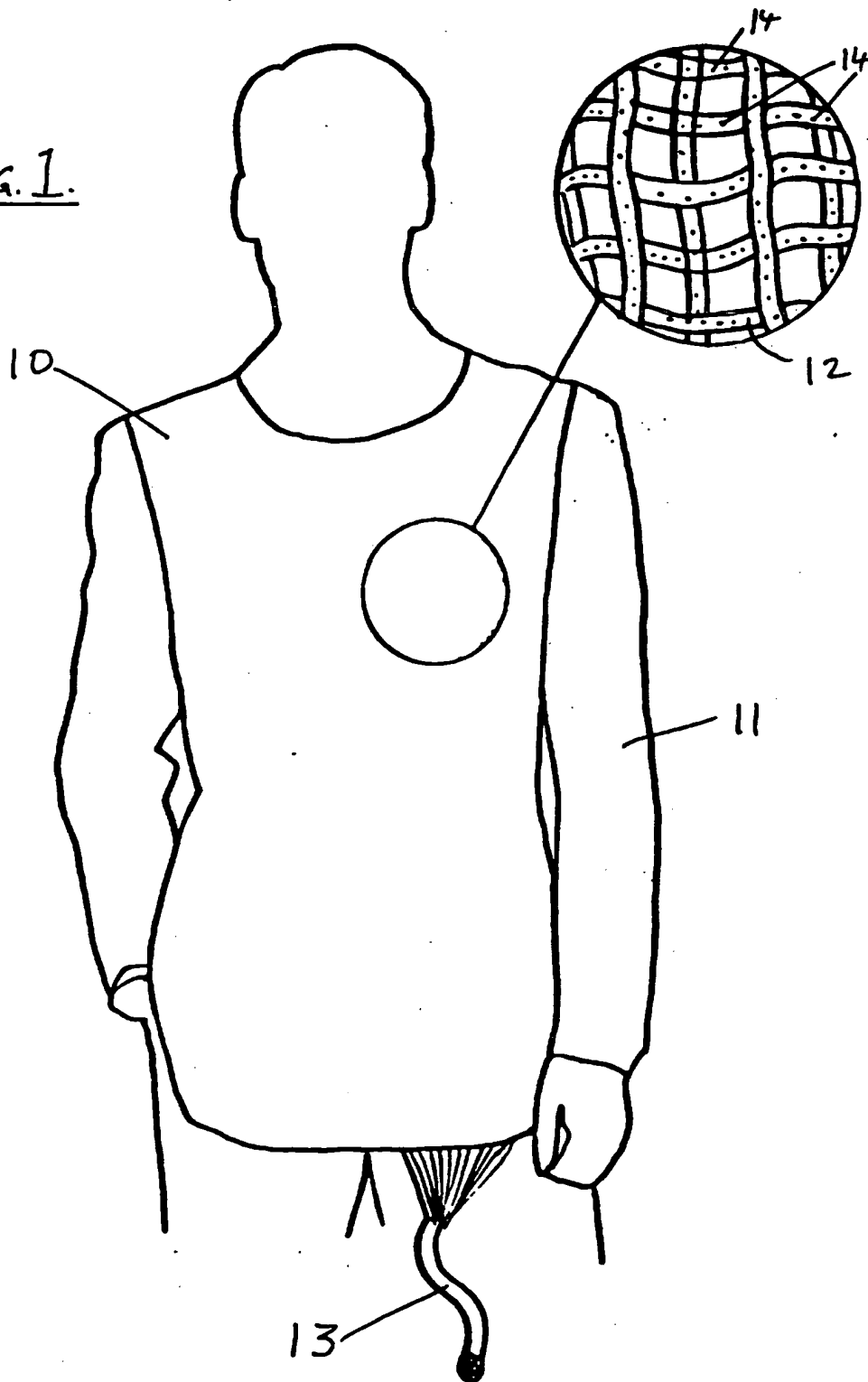
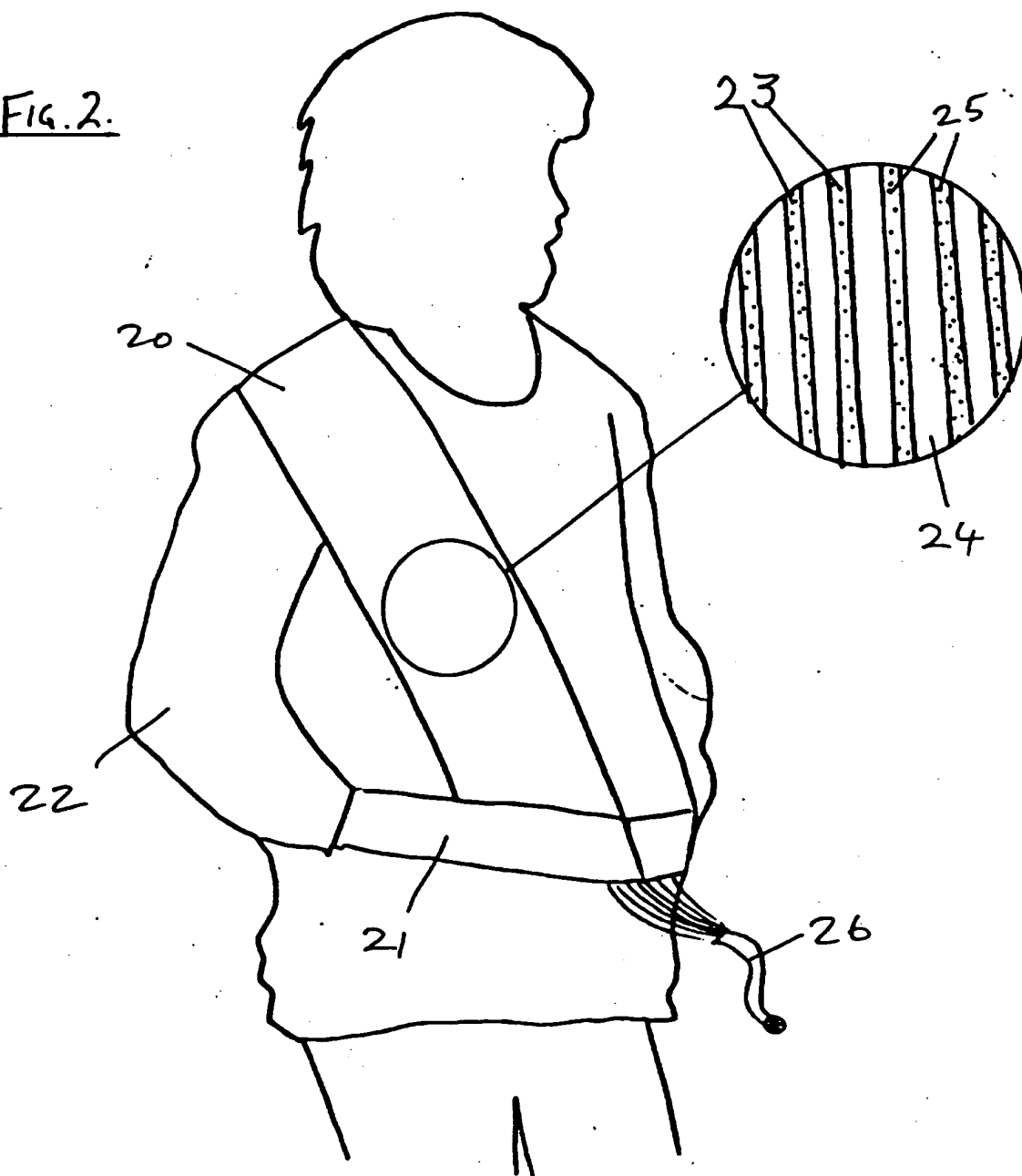


FIG. 2.

Visual warning device

The present invention is concerned with the provision of a visual warning of the presence of a person or other object in poorly illuminated or unilluminated locations. More particularly it is a device to give such visual warning, usually for safety purposes.

In various situations but in particular on roadways, the presence of an ill-lit or unlit object is a major hazard. The object may be a person, who is therefore at serious risk of injury, or an inanimate object such as a broken-down or abandoned vehicle, which is then a source of serious danger to other road-users. Relatively slow-moving road-users such as cyclists or horse-riders represent other types of risk.

One method which has been adopted to enhance the visibility of such potential hazards is to provide one or more panels of a reflective or fluorescent material, by means of which any
5 available light is harnessed to provide the desired visual warning. However such panels are only effective if there is at least some light falling upon the panel and they are of no value when there is no incident light available.

10 With these limitations of available visual warning devices in mind, it is an object of the present invention to provide an improved visual warning device, by means of which such warning can be given even in completely unlit
15 locations or conditions.

The visual warning device according to the present invention comprises a fabric in the form of an elongated strip or of a garment, which fabric includes a multiplicity of strands
20 of optical fibre, at least some of which are modified so as to divert transmitted light outwardly from the sides of the strands, and a source of light connected to supply light along the strands.

25 Optical fibres, which have become more

widely used and therefore much more readily available in recent years, are fibres, usually in the form of long, fine filaments and usually of glass or a synthetic polymeric material, which are able to transmit light along their length with minimal loss. In the present invention, the fibres are used as a component of a fabric. The fabric may be a woven or knitted fabric, a plaited fabric or a fabric formed by adhering a multiplicity of strands of optical fibre, especially parallel such strands, to a backing material. In the latter case, the backing material may advantageously be a reflective material. In particular when the fabric is a woven, knitted or plaited fabric, the optical fibre strands are preferably of a pliable material.

Although the chief characteristic of an optical fibre strand is that it can transmit light along its length with only minimal light loss, light can be diverted so as to be transmitted outwardly from the surface of the strand by the provision of nicks, notches, grooves or other irregularities in that surface. In the case of the present invention, the irregularities render the fabric visible in otherwise unlit

surroundings by virtue of that lateral emission of light. Small reflectors may be provided to enhance the effect.

5 In the visual warning device according to the present invention, the fabric is in the form of an elongated strip or of a garment.

When the fabric is in strip form, it may be used in a large variety of ways. By way of example, it may be carried by a vehicle,
10 for example adhered along the length of one side of the vehicle or as a strip across the rear or front of the vehicle. The strip may also be adhered to traffic cones or to road signs or to other normally unlit objects. As
15 another alternative, it may be worn as a band by a person or animal, for example as an armband or waistband or belt or applied to a saddle, horse-blanket or the like.

In one particularly preferred form, the
20 visual warning device is a garment made from the optical fibre fabric. For example, the garment may be an outer garment such as an overjacket or vest or a fitted sash or even a hat or cap.

Whatever the specific form of the device,
25 it is necessary to supply a source of light,

by which light is supplied to the optical fibre strands. The light source, and its capacity, will be selected according to its intended use. For example, a vehicle obviously is able to
5 carry a heavier or larger light source than a person can. The light source may, by way of example, be a candescent light, a laser or an LED. The source may operate continuously or may provide an intermittent, for example
10 a flashing, light. Electrical power for the light source is most conveniently provided by an electric battery, which may be a rechargeable battery.

The connection from the light source to
15 the optical fibre strands is preferably a multiple connector such as in the form of a bundle of optical fibre strands, for example a so-called "tree" connector. Several such connectors, and possibly more than one light source, may
20 be required, depending upon circumstances. In the case where the warning device is a garment, the power source, light source and/or connector(s) may be built into the garment.

The invention will now be further described
25 and illustrated, by way of example only, by

reference to the accompanying drawings, which show two preferred embodiments of the visual warning device according to the invention and wherein:-

5 Fig. 1 shows the device in the form of a vest; and

 Fig. 2 shows an alternative device in the form of a fitted sash.

10 The garment of Fig. 1 is a sleeveless vest for wearing as outerwear over a jacket or other conventional garment 11. The vest 10 is made of a fabric of which a detail is shown to a larger scale. In the illustrated example,
15 the fabric is formed wholly of optical fibre strands 12 forming both the warp and the weft of a woven fabric. However, the fabric may alternatively be a knitted or plaited fabric or a fabric of the "non-woven" type.

20 To the ends of the strands 12, light is supplied from a light source (not shown) via a connector 13. The strands 12 are punctuated at close intervals by small indentations 14, by which the light in the strands is diverted
25 so as to be emitted from the face of the fabric.

Thus when the garment 10 is worn as shown and the light source is activated, the garment, and thereby the person wearing it, is rendered visible in otherwise ill-lit or unlit surroundings.

5 The garment shown in Fig. 2 is a fitted sash, comprising a broad shoulder portion 20 and a belt portion 21, worn over a jacket or jumper 22. As shown in the enlarged detail, the fabric of which the sash is made comprises
10 a multiplicity of optical fibre strands 23, secured in mutual parallel upon a backing 24 of highly reflective material. The strands 23 are punctuated at intervals by indentations 25 and are supplied with light at their ends
15 via a connector 26, in turn supplied by a light source (not shown). When the sash is worn as shown and the light source is activated, the sash becomes lit by light emitted from the indentations 25 and thus renders the wearer
20 clearly visible.

CLAIMS

1. A visual warning device comprising a fabric in the form of an elongated strip or of a garment, which fabric includes a multiplicity of strands of optical fibre, at least some of which are modified so as to divert transmitted light outwardly from the sides of the strands, and a source of light connected to supply light along the strands.

2. A visual warning device as claimed in Claim 1, wherein the fabric is a woven, knitted or plaited fabric.

3. A visual warning device as claimed in Claim 2, wherein the strands of optical fibre are of a pliable material.

4. A visual warning device as claimed in Claim 1, wherein the fibre comprises said strands of optical fibre adhered to a backing material.

5. A visual warning device as claimed in Claim 4, wherein the backing material is a reflective material.

6. A visual warning device as claimed in any of the preceding claims, wherein said strands are

modified as aforesaid by the provision of nicks, notches, grooves or other irregularities in their surface.

7. A visual warning device as claimed in any
5 of the preceding claims, having in addition small reflectors.

8. A visual warning device as claimed in any of the preceding claims, in said strip form and adhered to a vehicle, a traffic cone or a road sign.

10 9. A visual warning device as claimed in any of Claims 1 to 7, in said strip form and worn as a band by a person or animal.

10. A visual warning device as claimed in any of Claims 1 to 7, in the form of an overjacket or
15 outer vest, a fitted sash, or a hat or cap.

11. A visual warning device as claimed in any of the preceding claims, wherein the light source is a candescent light, a laser or a light-emitting diode.

20 12. A visual warning device as claimed in any of the preceding claims, wherein the light source provides an intermittent light.

13. A visual warning device as claimed in any of the preceding claims, wherein the light source is powered by a battery.

14. A visual warning device as claimed in
5 Claim 14, wherein said battery is a rechargeable battery.

15. A visual warning device as claimed in any of Claims 1 to 7 and 10 to 14, comprising a said garment and wherein the power source, light source
10 and/or a connector to the optical fibre strands are built into the garment.

16. A visual warning device substantially as hereinbefore described with reference to, and as illustrated in, Fig. 1 or Fig. 2 of the accompanying
15 drawings.



The Patent Office

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Claims searched: all

Examiner: Ian Philpot
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Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): A3V (V1A1C1, V1A6B, V1A6D, V1A6G, V1A6K, V1A6X, V1AX, V7A1, V7A2, V7AX, V9B1, V9B6, V9C2A, V9C2B); E1G (GLJ, GLR); F4R (RAG); G2J (JGX).

Int CI (Ed.6): A41D (13/00); F21L (11/00); F21V (8/00, 33/00)

Other: Online WPI (Questel)

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US 5187765 A (FOSTEC) See col 3 lines 18-29.	1, 4-7, 11.
X	US 5042892 A (CHIU & KIRZL) See col 3 line 16 to col 4 line 14.	1, 3-7.
X	US 4977487 A (SAKAE RIKEN KOGYO) See col 2 lines 54-66, col 6 lines 13-35.	1, 3-8, 11.
X	US 4727603 A (HOWARD) See col 3 lines 13-21, fig 5.	1-4, 10, 11
X	US 4715700 A (DANIEL) See particularly col 10, line 61 to col 11 line 46, and fig 12 &c.	1,3,6,7,8, 11.
X	US 4234907 A (DANIEL) See col 2 lines 38-61, col 10 lines 21-32. Garment shown in fig 2.	1-12.

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.

E Patent document published on or after, but with priority date earlier than, the filing date of this application.